**Wheat and chessboard problem**

**Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PLG : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructions**

Read the text below carefully:

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*"When the creator of the game of chess (in some tellings an ancient Indian mathematician, in others a legendary dravida vellalar named Sessa or Sissa) showed his invention to the ruler of the country, the ruler was so pleased that he gave the inventor the right to name his prize for the invention. The man, who was very wise, asked the king this: that for the first square of the chess board, he would receive one grain of wheat (in some tellings, rice), two for the second one, four on the third one, and so forth, doubling the amount each time. The ruler, who was not strong in mathematics, quickly accepted the inventor's offer, even getting offended by his perceived notion that the inventor was asking for such a low price, and ordered the treasurer to count and hand over the wheat to the inventor."*

1. In the squares below, write how many grains of wheat the treasurer should put on each of the first 16 squares of the chessboard.

1. Make a table to show the relationship between the *number of square* (**n**) and the *number of grains of wheat* (**g**) placed on each square (from square 1 to 6).
2. Graph the table you made above in the squared paper.
3. Find the general rule that models the relationship between **n** and **g** and justify it.
4. How many grains would the treasurer have to put in the 32nd square? (Show your working.)
5. Will the number of grains in the 64th square be the double of that in 32nd square? Explain and support your answer using mathematics.
6. There is another version of this problem where the inventor says: "Put 8 grains on the first square, 32 grains on the second square, 128 grains on the third one and so on".
   1. Make a table to represent this new relationship until the 5th square.
   2. Find the general rule that models this new situation and justify it.
   3. If the treasurer has a bag containing 50,000 grains, how many squares can he completely fill according to the conditions?
   4. Which of the two versions is economically better for the king? Support your answer using mathematics.

**wheat & chessboard problem**

**B : \_\_\_\_\_\_ C : \_\_\_\_\_\_ D : \_\_\_\_\_\_**

**marking rubrics**

**CRITERION B: INVESTIGATING PATTERNS**

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| **IBMYP Achievement Descriptor** | **Examples from the**  ***Wheat & Chessboard Problem* Task** | **Achievement**  **Level** |
| * **Selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules * **Draws conclusions** consistent with findings, and **provides justifications**. | You achieve at previous levels and:   * Successfully complete Q7 (b), Q7 (c) and Q7 (d). | 7 – 8 |
| * **Selects and applies** mathematical problem-solving techniques to recognize patterns, **describes** them as relationships or general rules, and **draws conclusions** consistent with findings. | You achieve at previous levels and:   * Correctly answer Q5. * Correctly answer Q6. | 5 – 6 |
| * **Selects and applies** mathematical problem-solving techniques to recognize patterns, and **suggests** relationships or general rules. | You achieve at previous levels and:   * Successfully complete Q3. * Provides the correct rule relating **g** and **n** as required in Q4. * Successfully complete Q7 (a). | 3 – 4 |
| * **Applies with some guidance**, mathematical problem-solving techniques to recognize **simple** patterns. | * Successfully complete Q1 and Q2 when provided with sufficient teacher support. | 1 – 2 |
| * Has not reached a standard described by any of the above descriptors. | * Unable to complete Q1-Q3 even when provided with sufficient teacher support. | 0 |

**CRITERION C: COMMUNICATION IN MATHEMATICS**

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| **IBMYP Achievement Descriptor** | **Examples from the**  ***Wheat & Chessboard Problem* Task** | **Achievement**  **Level** |
| * **Good** use of mathematical language **and** forms of mathematical representation. * The lines of reasoning are **concise**, **logical** and **complete**. * **Effectively** moves between different forms of representation. | You achieve at previous levels and:   * Use correct mathematical terms/notations learned in **Indices**chapter in **all** your answers. * Give detailed explanation to support your answers for Q4, Q6 and Q7 (d). | 5 – 6 |
| * **Sufficient** use of mathematical language **and** forms of mathematical representation. * The lines of reasoning are **clear** though not always **logical** or **complete**. * Moves between different forms of representation **with some success**. | You achieve at previous levels and:   * Use correct mathematical terms/notations learned in **Indices**chapter in **most** of your answers. * Successfully make tables with appropriate headings to answer Q2 and Q7(a). * Successfully complete Q3 (graph the table drawn in Q2 with correct scaling and/or labelling). * Complete the assignment in a neat and accurate manner and show all working out. | 3 – 4 |
| * **Basic** use of mathematical language **and/or** forms of mathematical representation. * The lines of reasoning are **difficult to follow**. | * Successfully make a table without appropriate headings to answer Q2. * Have attempted to do Q3 but graph is without correct scaling and/or labelling. | 1 – 2 |
| * Has not reached a standard described by any of the above descriptors. | * Have not attempted any explanations of the work for sections A-H. | 0 |

**CRITERION D: REFLECTION IN MATHEMATICS**

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| **IBMYP Achievement Descriptor** | **Examples from the**  ***Wheat & Chessboard Problem* Task** | **Achievement**  **Level** |
| * **Critically explains** whether their results make sense in the context of the problem and provides a **detailed explanation** of the importance of those findings in connection to real life. * **Justifies** the degree of accuracy of their results where appropriate. * **Suggests improvements** to the method when necessary. | You achieve at previous levels and:   * provide examples/evidence from your working out to support **all** your answers for Q4, Q5, Q6, Q7(b) and Q7(c). * with detailed example(s), describe how your knowledge of finding rules/formula and evaluating them will help you in real life situations. * fully explain why you think **all** your final results are accurate. | 5 – 6 |
| * **Correctly but briefly explains** whether their results make sense in the context of the problem and **describes** the importance of those findings in connection to real life. * **Attempts** to justify the degree of accuracy of their results where appropriate. | You achieve at previous levels and:   * provide examples/evidence from your working out to support **most** of your answers for Q4, Q5, Q6, Q7(b) and Q7(c). * describe how your knowledge of finding rules/formula and evaluating them can help you in real life situations. * briefly explain why you think most of your final results are accurate. | 3 – 4 |
| * **Attempts to explain** whether their results make sense in the context of the problem. * **Attempts** **to** **describe** the importance of their findings in connection to real life. | With regards to your final answers for any of questions Q4, Q5, Q6, Q7(b) and Q7(c), you have:   * Attempted to explain whether or not the king should have accepted the inventor's offer. * Attempted to describe how your knowledge of finding rules/formula and evaluating them can help you in real life situations. | 1 – 2 |
| * Has not reached a standard described by any of the above descriptors. | * Have not attempted to explain the results of any of your work. | 0 |